Standard Characteristics Example

Standard characteristics described below are just examples of the 38D5 Group's characteristics and are not guaranteed.
For rated values, refer to "38D5 Group Data sheet".

(1) Power Source Current Standard Characteristics Example (Vcc-Icc)

When system is operating in frequency/2 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

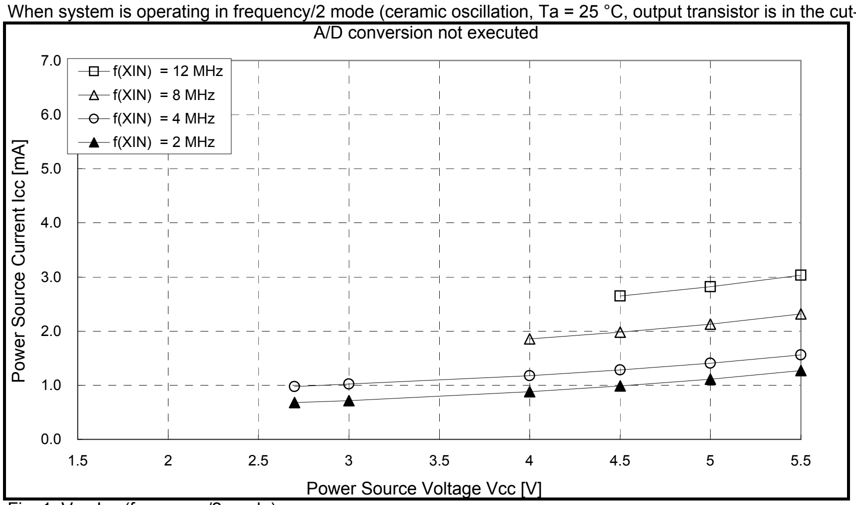


Fig. 1. Vcc-Icc (frequency/2 mode)

When system is operating in frequency/4 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

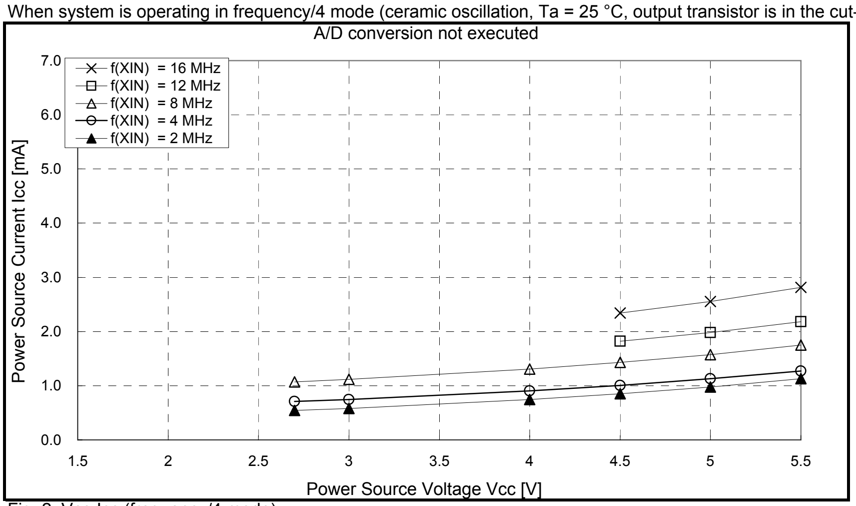


Fig. 2. Vcc-Icc (frequency/4 mode)

When system is operating in frequency/8 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

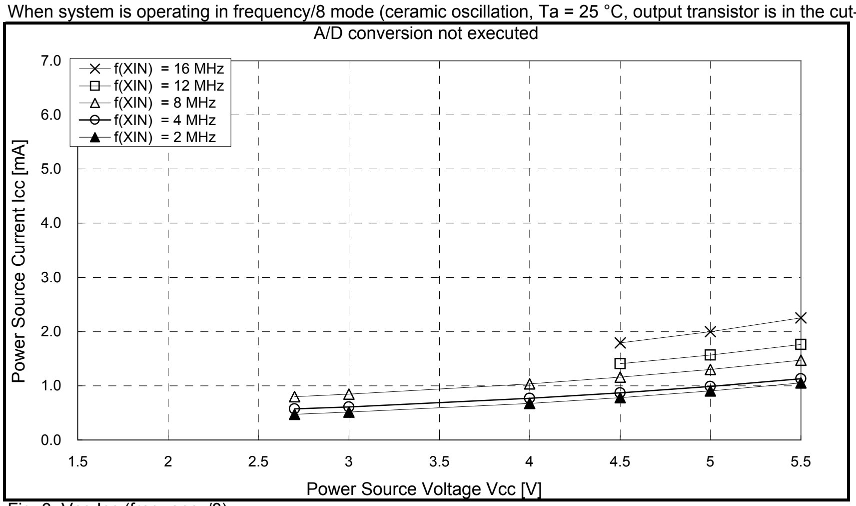


Fig. 3. Vcc-Icc (frequency/8)

At WIT instruction executed (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

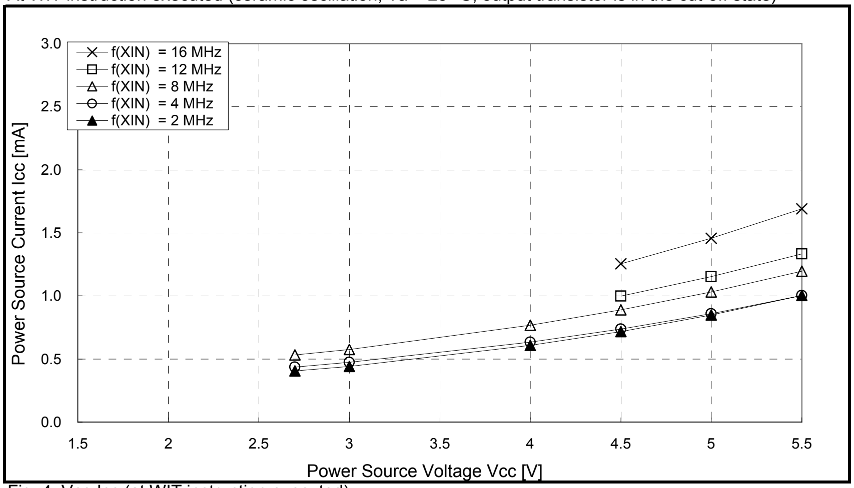


Fig. 4. Vcc-Icc (at WIT instruction executed)

At STP instruction executed (Ta = 25 °C, output transistor is in the cut-off state)

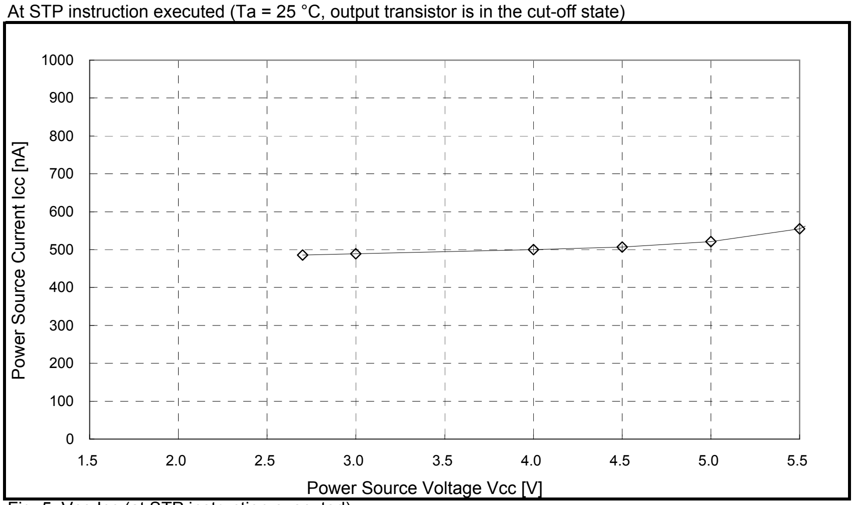


Fig. 5. Vcc-Icc (at STP instruction executed)

At 12 MHz frequency/2, increment at A/D conversion executed (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

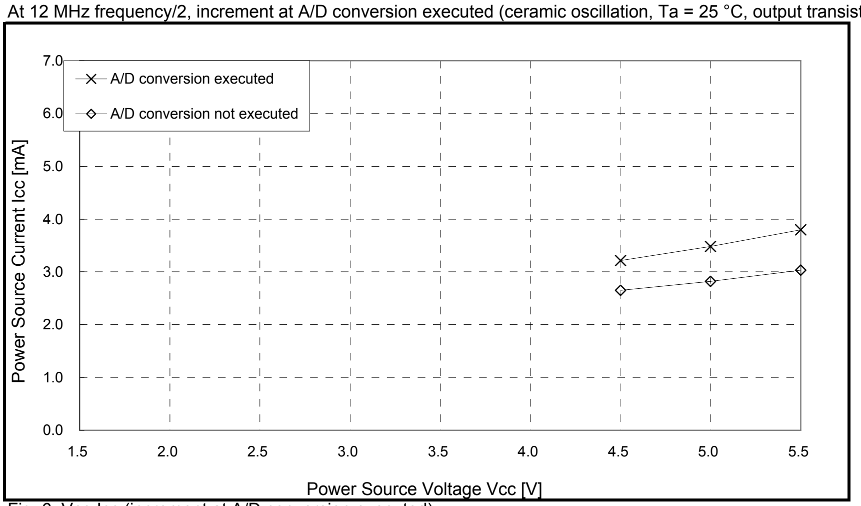


Fig. 6. Vcc-Icc (increment at A/D conversion executed)

At 16 MHz frequency/4 mode, increment at A/D conversion executed (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

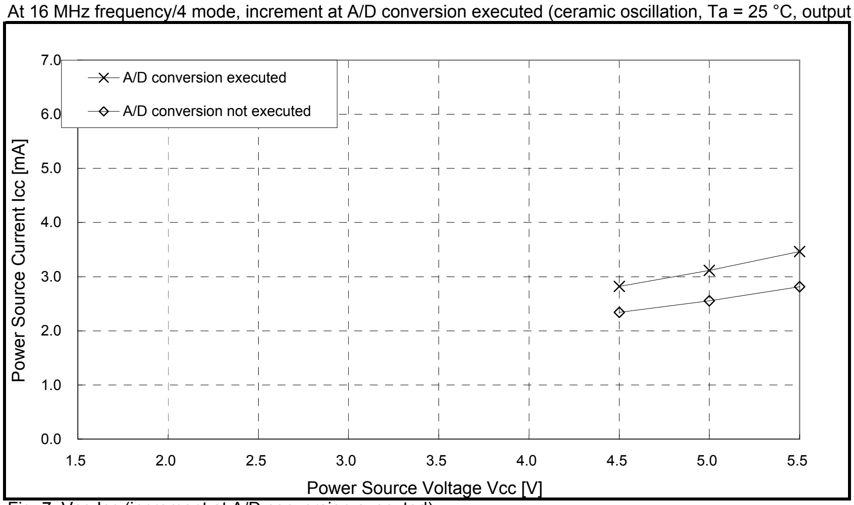


Fig. 7. Vcc-Icc (increment at A/D conversion executed)

At 16 MHz frequency/8 mode, increment at A/D conversion executed (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

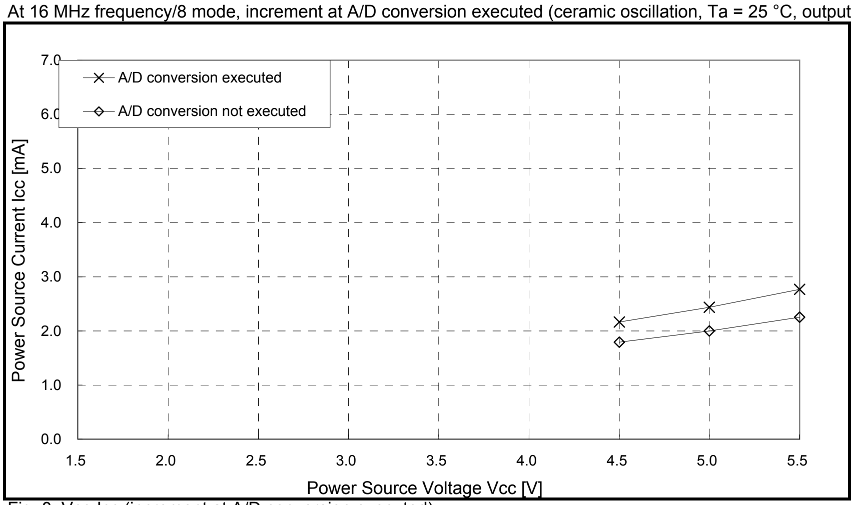


Fig. 8. Vcc-Icc (increment at A/D conversion executed)

When system is operating in low-speed mode (crystal oscillation, ceramic oscillation stop, Ta = 25 °C, output transistor is in the cut-off state)

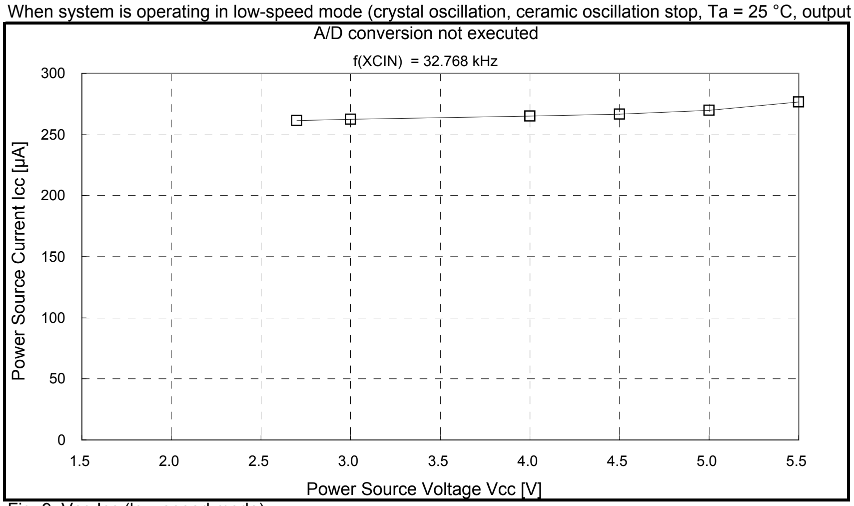


Fig. 9. Vcc-Icc (low-speed mode)

At WIT instruction executed (crystal oscillation, ceramic oscillation stop, Ta = 25 °C, output transistor is in the cut-off state)

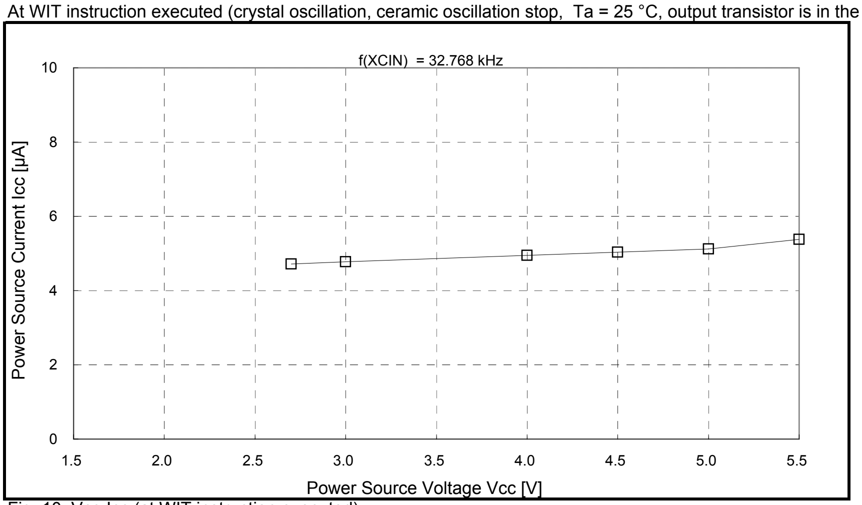


Fig. 10. Vcc-Icc (at WIT instruction executed)

When system is operating in on-chip oscillator mode (external oscillation stop, output transistor is in the cut-off state)

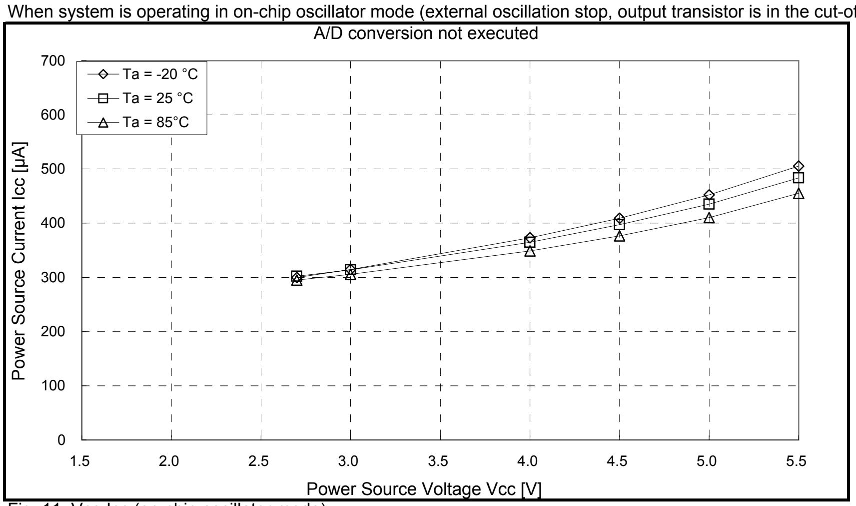


Fig. 11. Vcc-Icc (on-chip oscillator mode)

On-chip oscillator operating mode, at WIT instruction executed (external oscillation stop, output transistor is in the cut-off state)

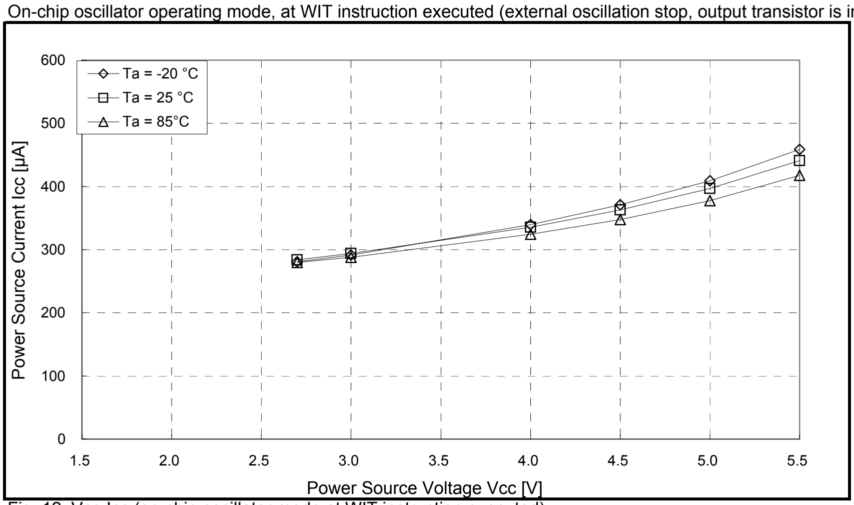


Fig. 12. Vcc-Icc (on-chip oscillator mode at WIT instruction executed)

(2) Power Supply Current Standard Characteristics Example (f(XIN) -Icc)

When system is operating in frequency/2 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)
A/D conversion not executed

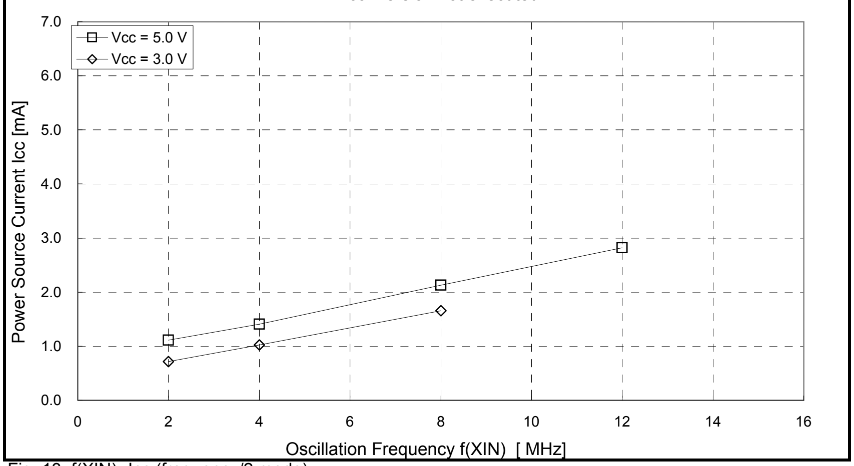


Fig. 13. f(XIN) -Icc (frequency/2 mode)

When system is operating in frequency/4 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)
A/D conversion not executed

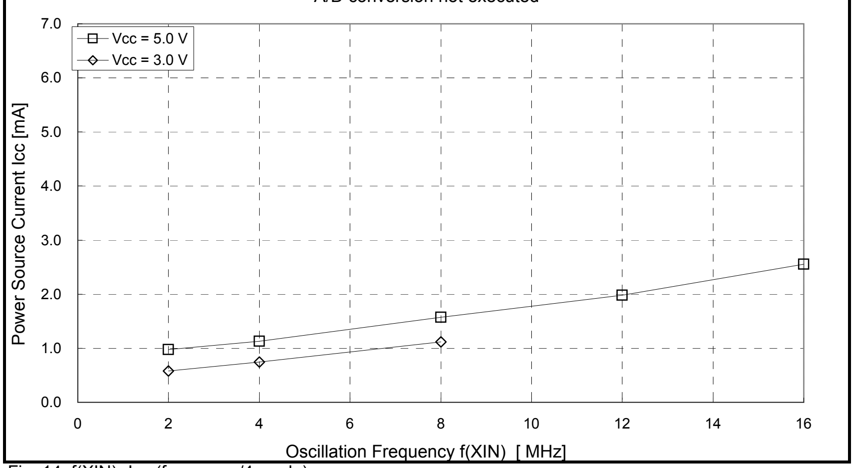


Fig. 14. f(XIN) -Icc (frequency/4 mode)

When system is operating in frequency/8 mode (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)
A/D conversion not executed

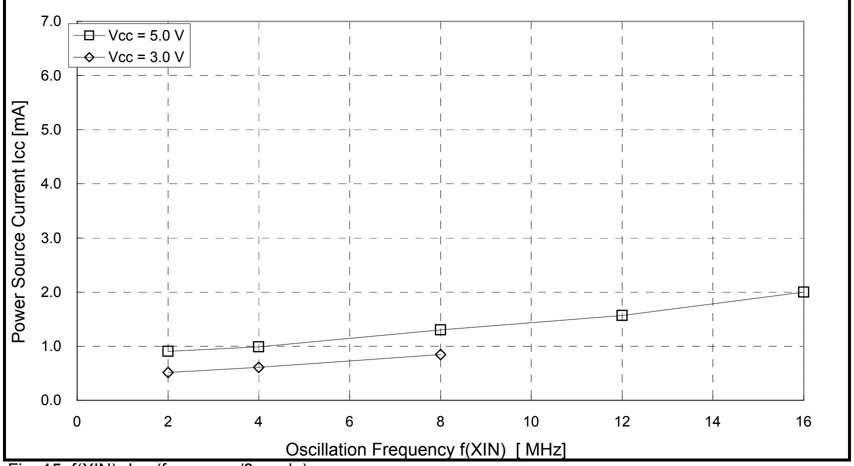


Fig. 15. f(XIN) -Icc (frequency/8 mode)

At WIT instruction executed (ceramic oscillation, Ta = 25 °C, output transistor is in the cut-off state)

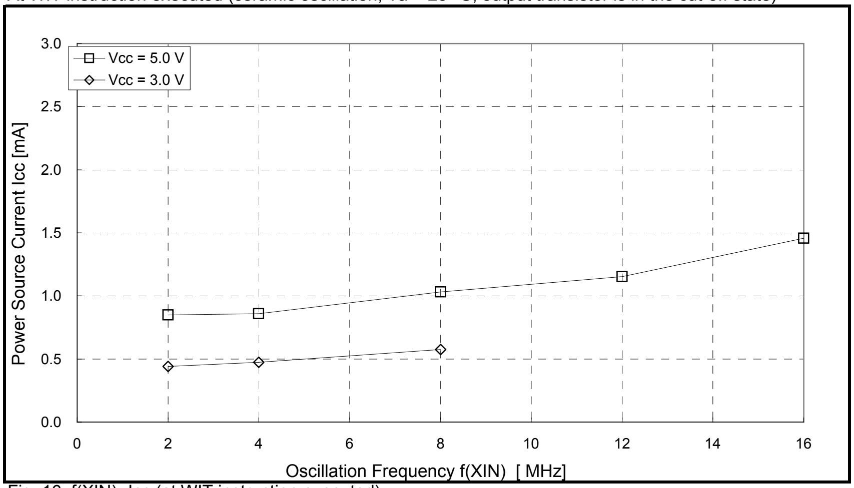


Fig. 16. f(XIN) -Icc (at WIT instruction executed)

(3) Power Supply Current Standard Characteristics Example (Ta-Icc)

When system is operating in on-chip oscillator mode (external oscillation stop, output transistor is in the cut-off state)

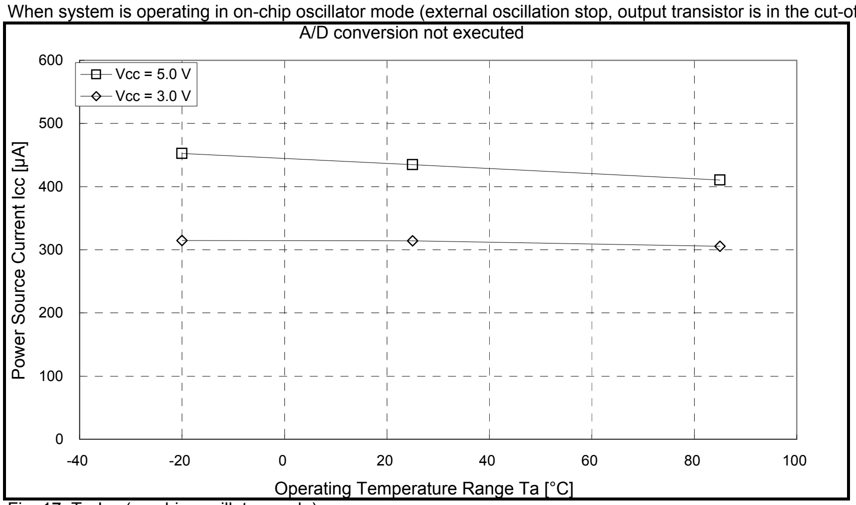


Fig. 17. Ta-Icc (on-chip oscillator mode)

On-chip oscillator operating mode at WIT instruction executed (external oscillation stop, output transistor is in the cut-off state)

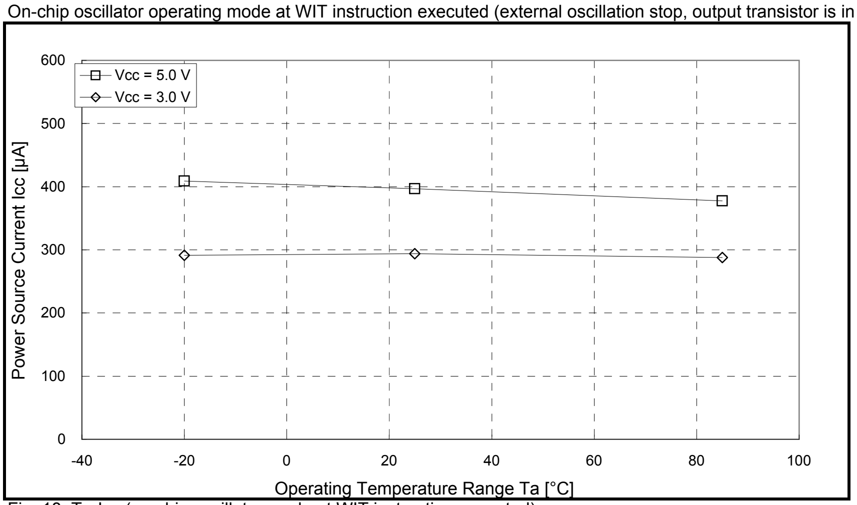


Fig. 18. Ta-Icc (on-chip oscillator mode at WIT instruction executed)

(4) Port Standard characteristics Example (VOH-IOH)

VOH-IOH (Vcc = 5.5 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

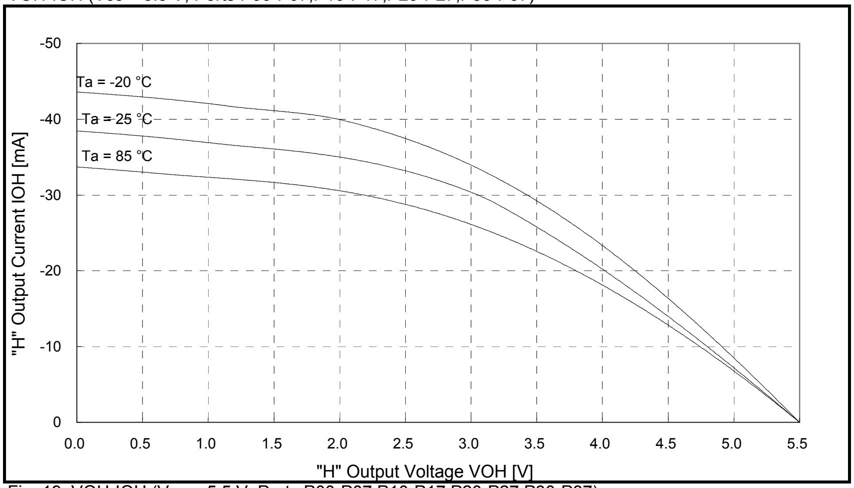


Fig. 19. VOH-IOH (Vcc = 5.5 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOH-IOH (Vcc = 4.0 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

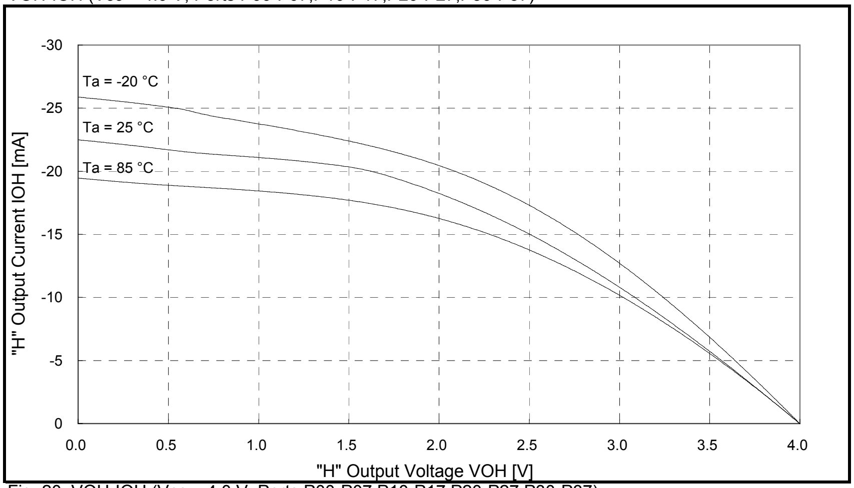


Fig. 20. VOH-IOH (Vcc = 4.0 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOH-IOH (Vcc = 2.7 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

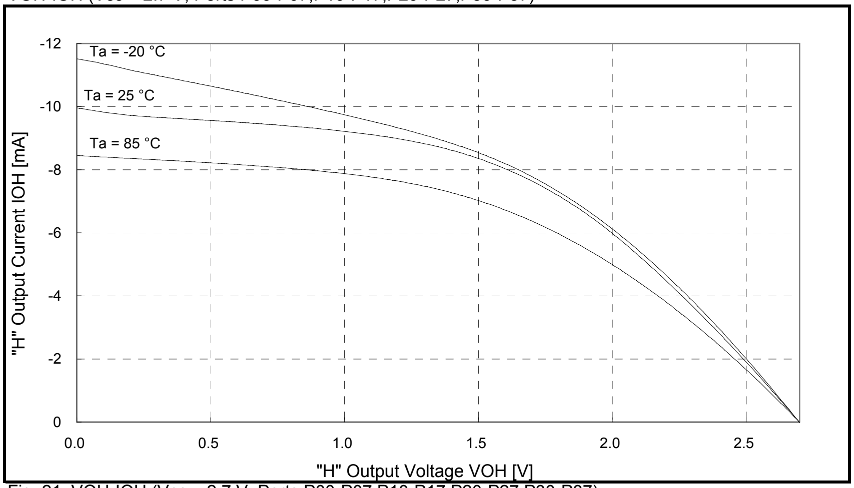


Fig. 21. VOH-IOH (Vcc = 2.7 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOH-IOH (Vcc = 5.5 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

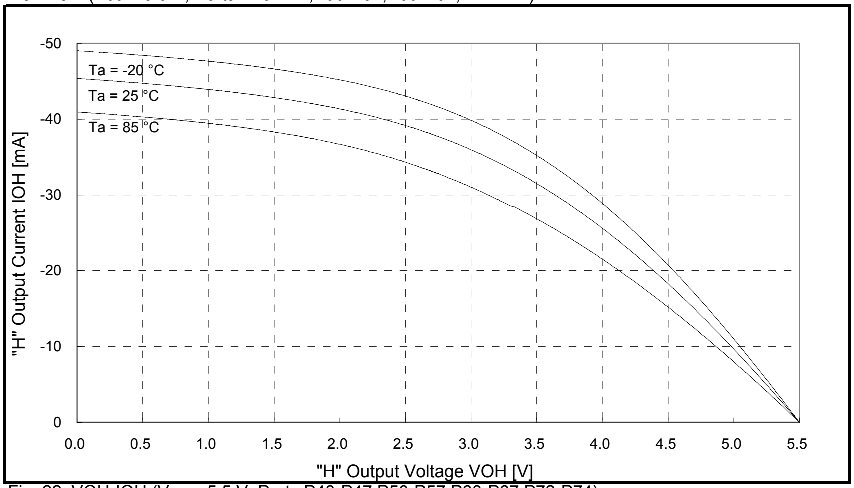


Fig. 22. VOH-IOH (Vcc = 5.5 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

VOH-IOH (Vcc = 4.0 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

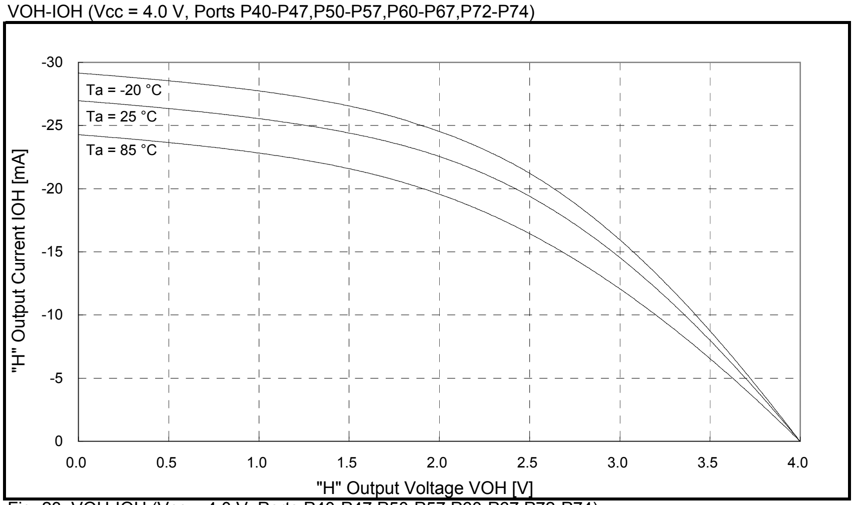


Fig. 23. VOH-IOH (Vcc = 4.0 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

VOH-IOH (Vcc = 2.7 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

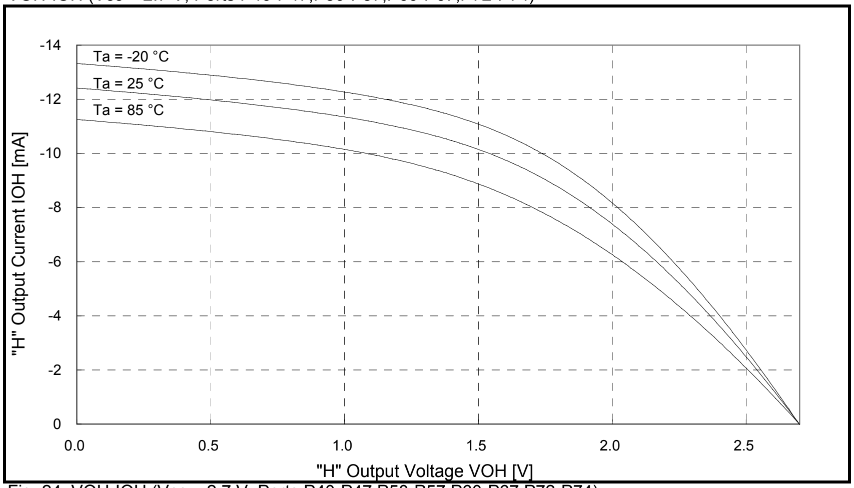


Fig. 24. VOH-IOH (Vcc = 2.7 V, Ports P40-P47,P50-P57,P60-P67,P72-P74)

(5) Port Standard Characteristics Example (VOL-IOL)

VOL-IOL (Vcc = 5.5 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

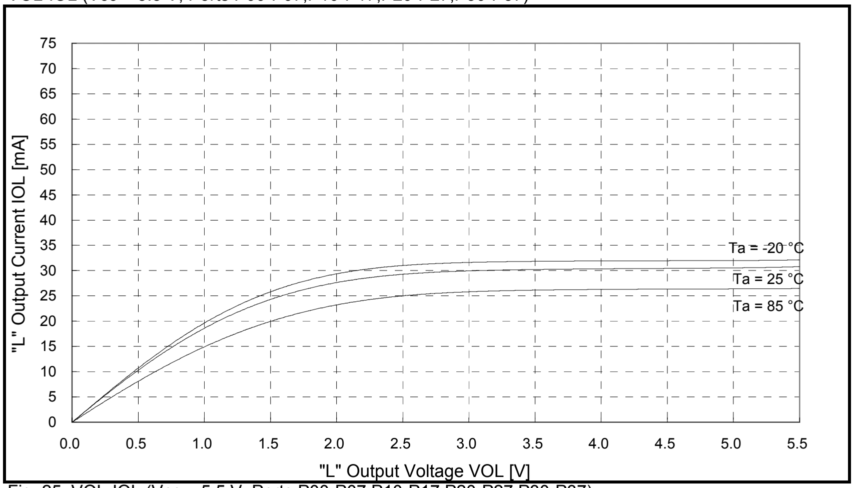


Fig. 25. VOL-IOL (Vcc = 5.5 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOL-IOL (Vcc = 4.0 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

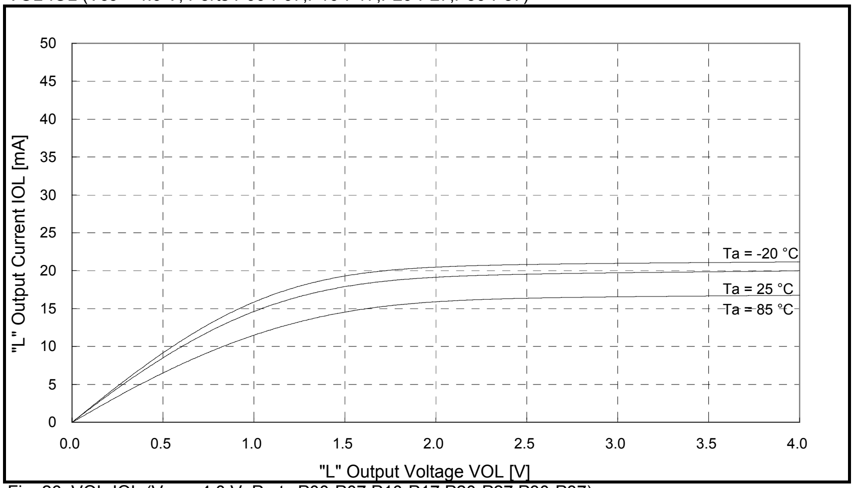


Fig. 26. VOL-IOL (Vcc = 4.0 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOL-IOL (Vcc = 2.7 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

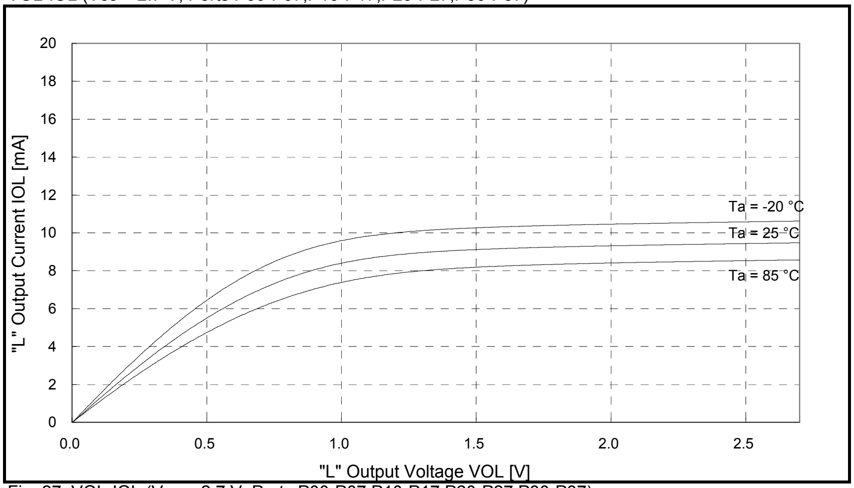


Fig. 27. VOL-IOL (Vcc = 2.7 V, Ports P00-P07,P10-P17,P20-P27,P30-P37)

VOL-IOL (Vcc = 5.5 V,Ports P62-P67)

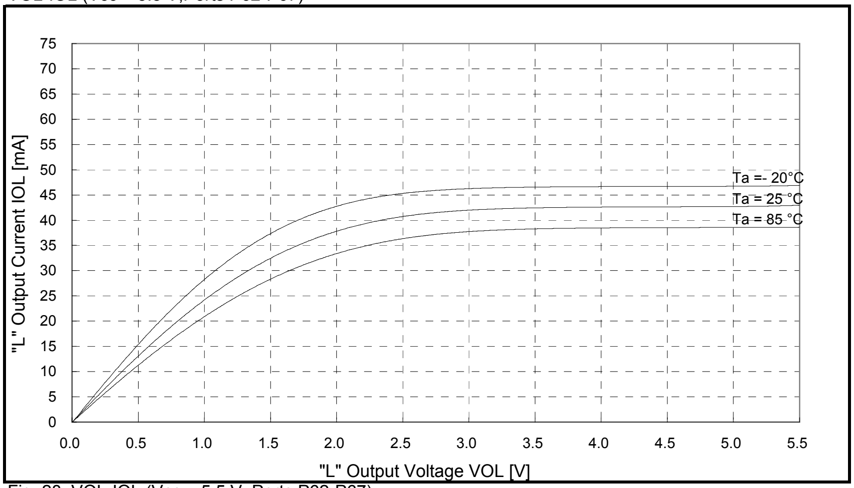


Fig. 28. VOL-IOL (Vcc = 5.5 V, Ports P62-P67)

VOL-IOL (Vcc = 4.0 V, Ports P62-P67)

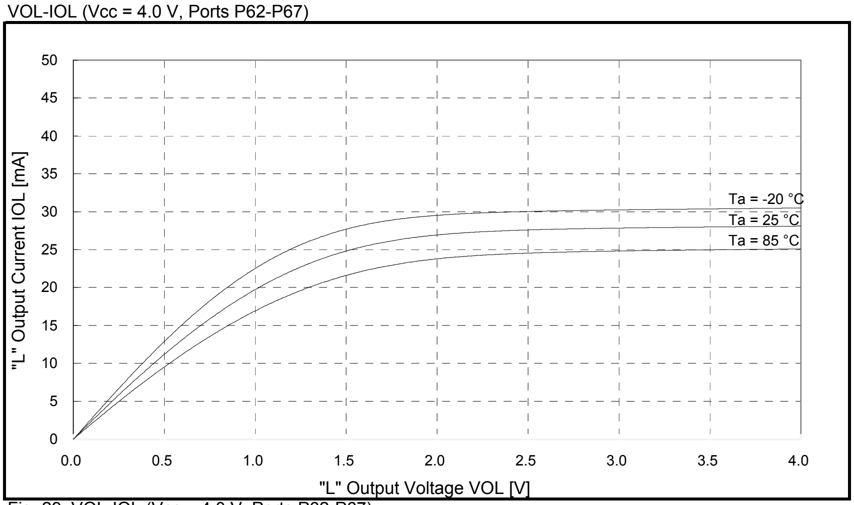


Fig. 29. VOL-IOL (Vcc = 4.0 V, Ports P62-P67)

VOL-IOL (Vcc = 2.7 V, Ports P62-P67)

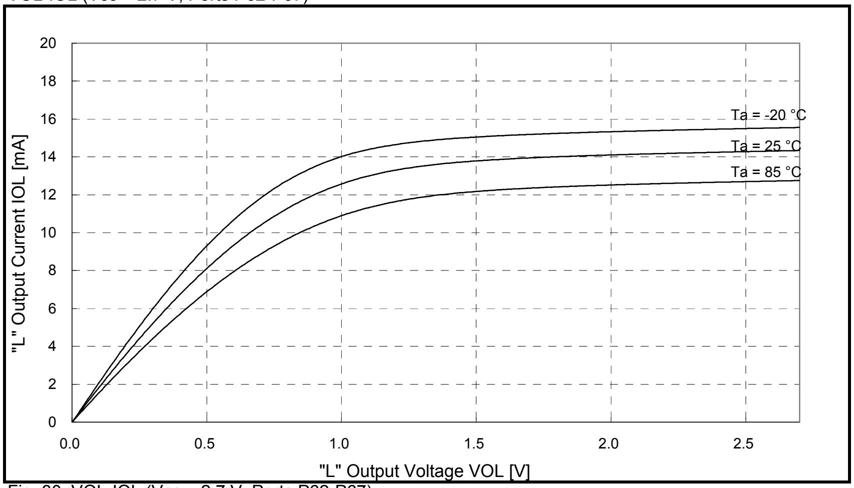


Fig. 30. VOL-IOL (Vcc = 2.7 V, Ports P62-P67)

VOL-IOL (Vcc = 5.5 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

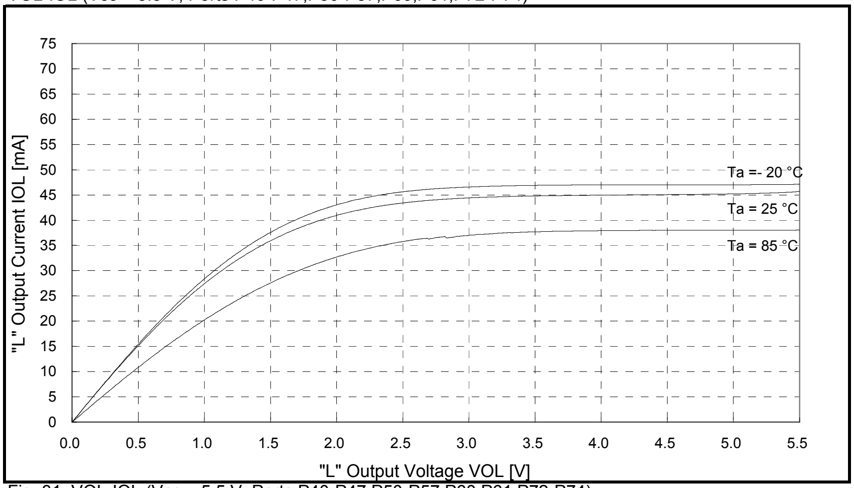


Fig. 31. VOL-IOL (Vcc = 5.5 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

VOL-IOL (Vcc = 4.0 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

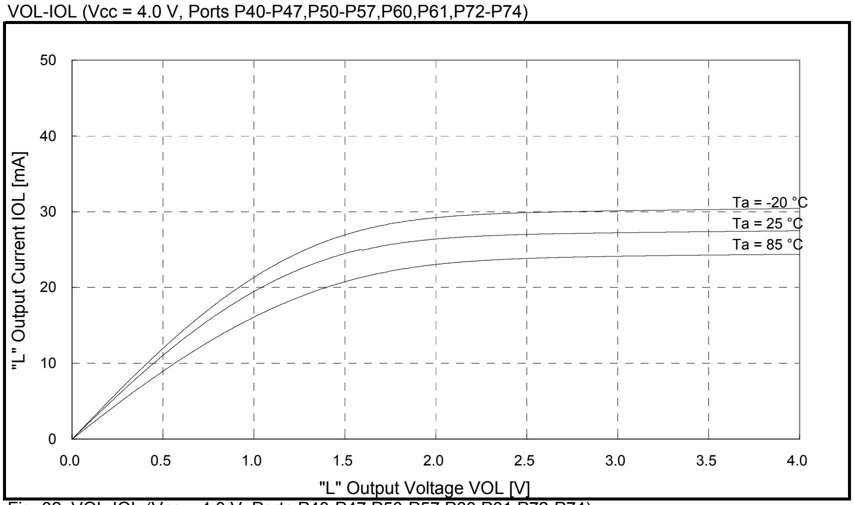


Fig. 32. VOL-IOL (Vcc = 4.0 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

VOL-IOL (Vcc = 2.7 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

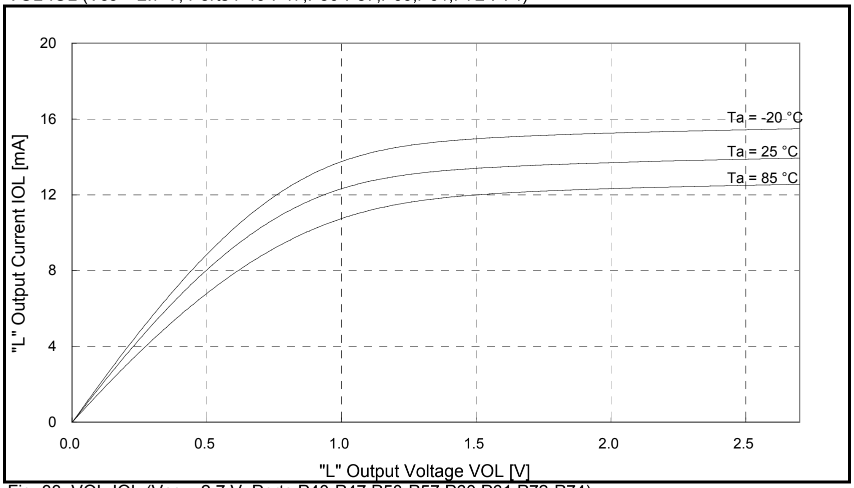


Fig. 33. VOL-IOL (Vcc = 2.7 V, Ports P40-P47,P50-P57,P60,P61,P72-P74)

(6) Port Standard Characteristics Example (Vcc-IIL)

Vcc-IIL (Ports P00-P07, P10-P17, P20-P27,P30-37 when connecting pull-up transistor) (clerical error revised in rev.2.00)

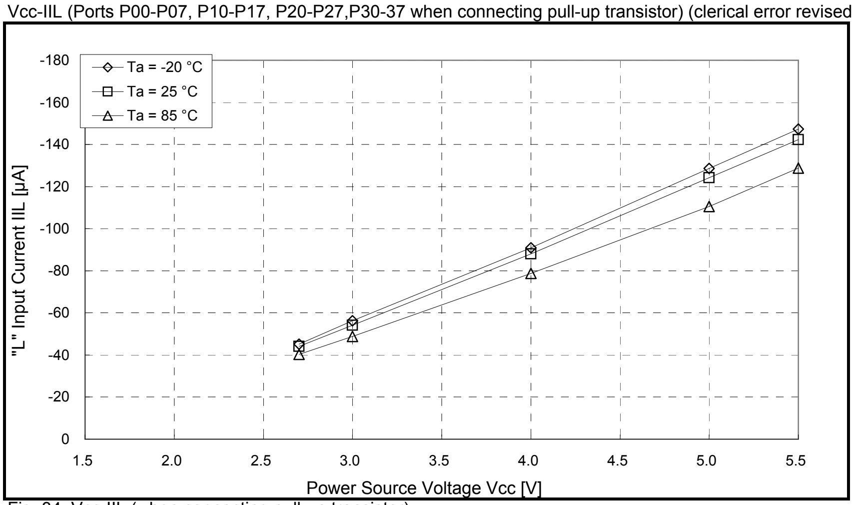


Fig. 34. Vcc-IIL (when connecting pull-up transistor)

Vcc-IIL (Ports P40-P47, P50-P57, P60-P62,P72-P74 when connecting pull-up transistor) (revised in rev.2.00)

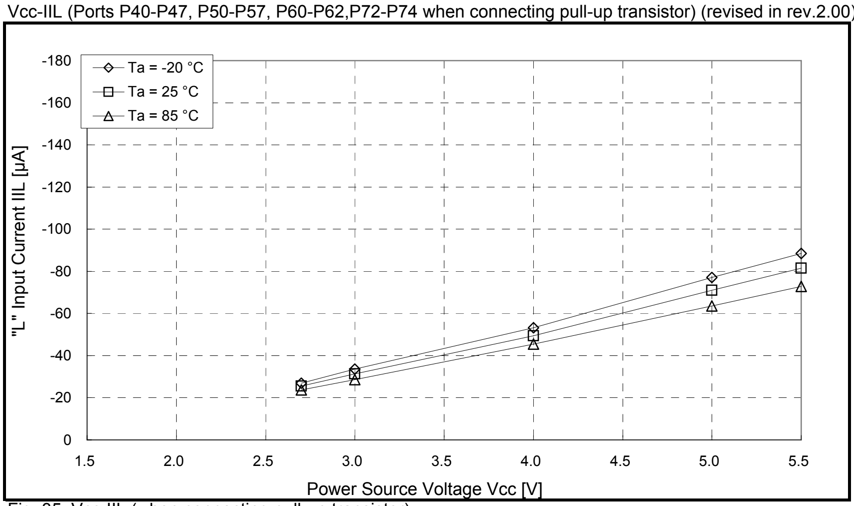


Fig. 35. Vcc-IIL (when connecting pull-up transistor)

(7) Port Standard Characteristics Example (Vcc-VIHL)

Vcc-VIHL (I/O Ports (CMOS) , Ta = 25 °C, Ports P41,P43,P50-P57, P72-P74)

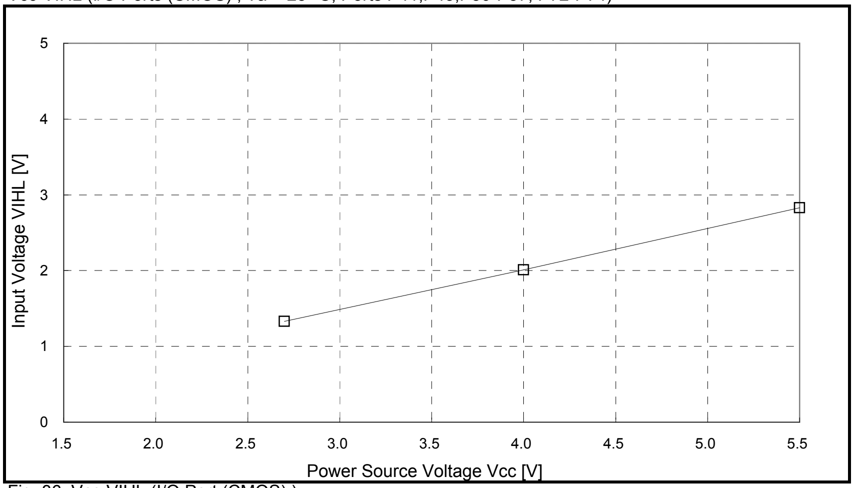


Fig. 36. Vcc-VIHL (I/O Port (CMOS))

Vcc-VIHL (I/O Ports (CMOS) , Ta = 25 °C, Ports P40,P42,P44-P47, P70,P71)

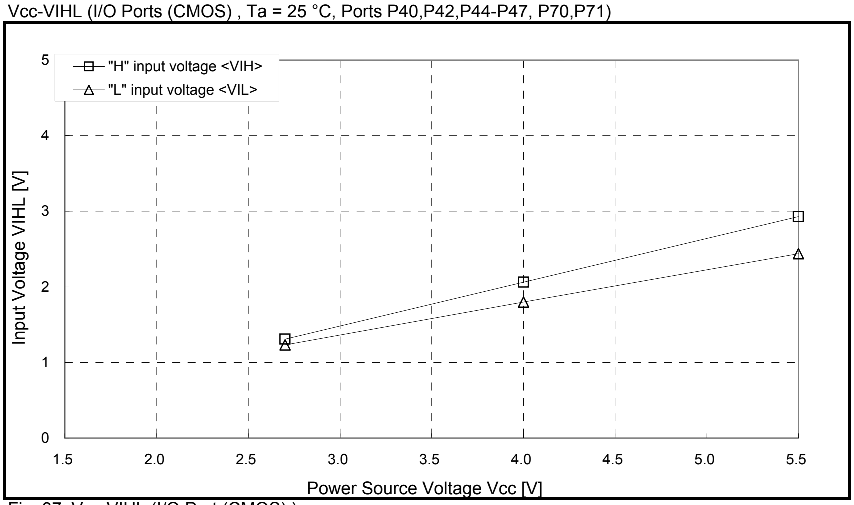


Fig. 37. Vcc-VIHL (I/O Port (CMOS))

Vcc-VIHL (RESET pin, Ta = 25 °C)

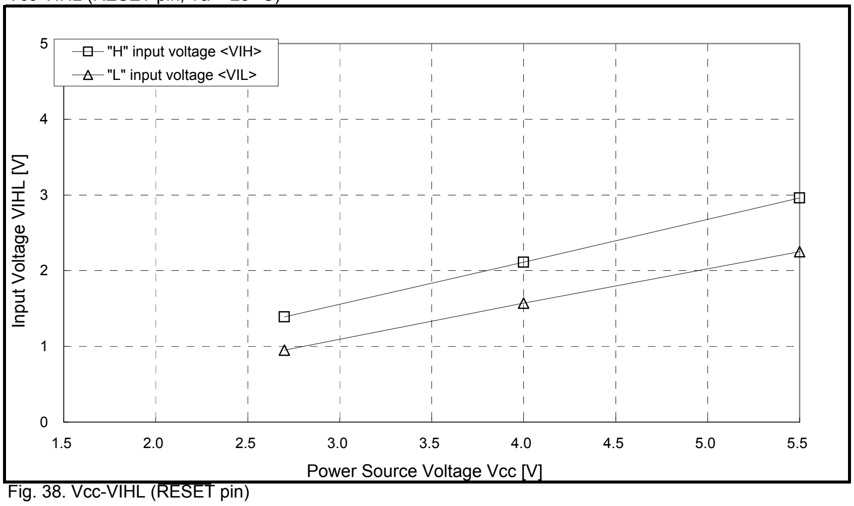


Fig. 38. Vcc-VIHL (RESET pin)

Vcc-VIHL (XIN pin, Ta = 25 °C)

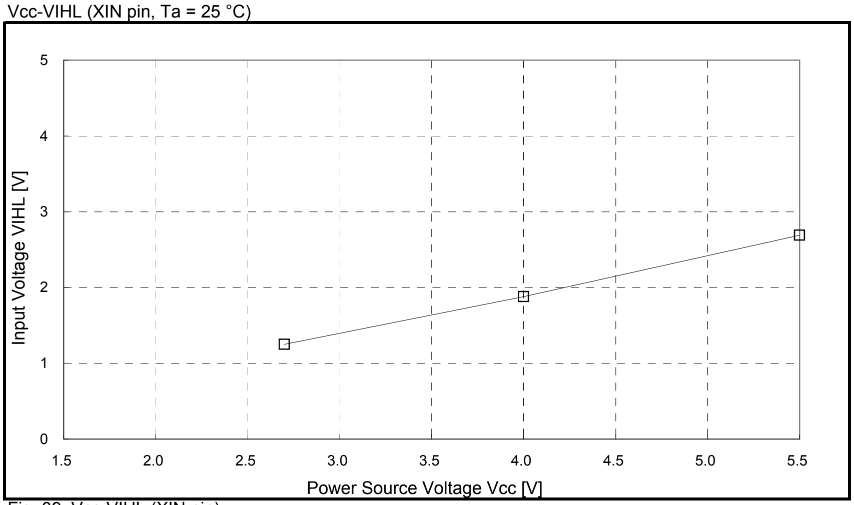


Fig. 39. Vcc-VIHL (XIN pin)

Vcc-HYS (RESET pin, Ta = 25 °C)

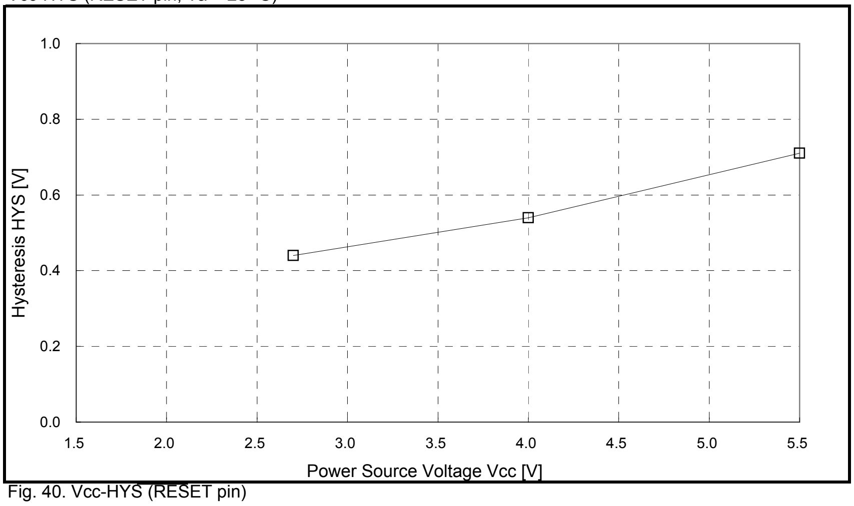


Fig. 40. Vcc-HYS (RESET pin)

Vcc-HYS (SIO function pin (RXD, SCLK) , Ta = 25 °C)

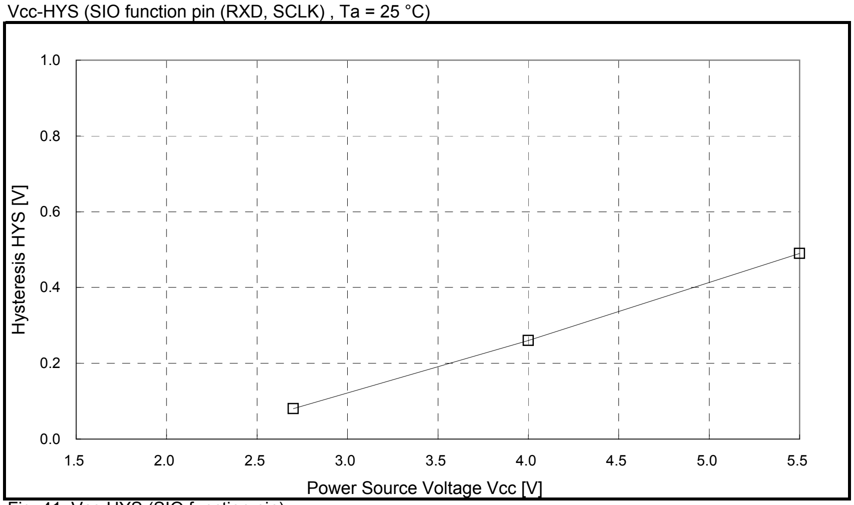


Fig. 41. Vcc-HYS (SIO function pin)

Vcc-HYS (INT0- INT2, CNTR0, CNTR1, KW0-KW7, Ta = 25 °C)

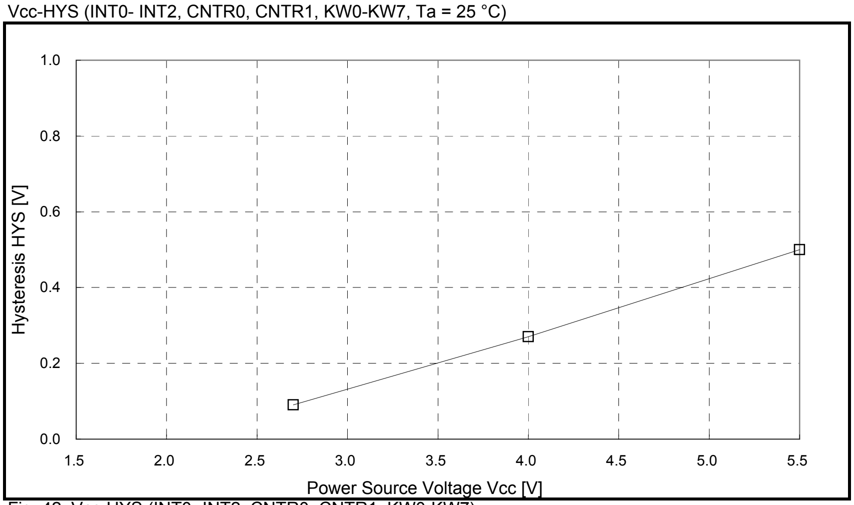


Fig. 42. Vcc-HYS (INT0- INT2, CNTR0, CNTR1, KW0-KW7)

(8) Port Standard Characteristics Example (VIN-IIA, A/D conversion mode = 10bit)

VIN-IIA (A/D converter operation, f(Xin) = 12 MHz, frequency/2 mode, A/D conversion clock = f(Xin), Vcc = VREF = 5.5 V, Ta = 25 °C)

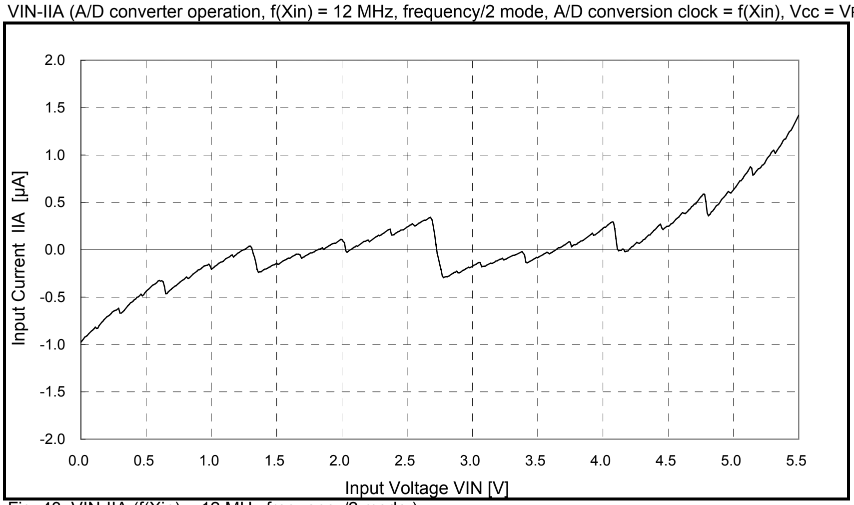


Fig. 43. VIN-IIA (f(Xin) = 12 MHz frequency/2 mode)

VIN-IIA (A/D converter operation, f(Xin) = 10 MHz, frequency/2 mode, A/D conversion clock = f(Xin), Vcc = VREF = 5.5 V, Ta = 25 °C)

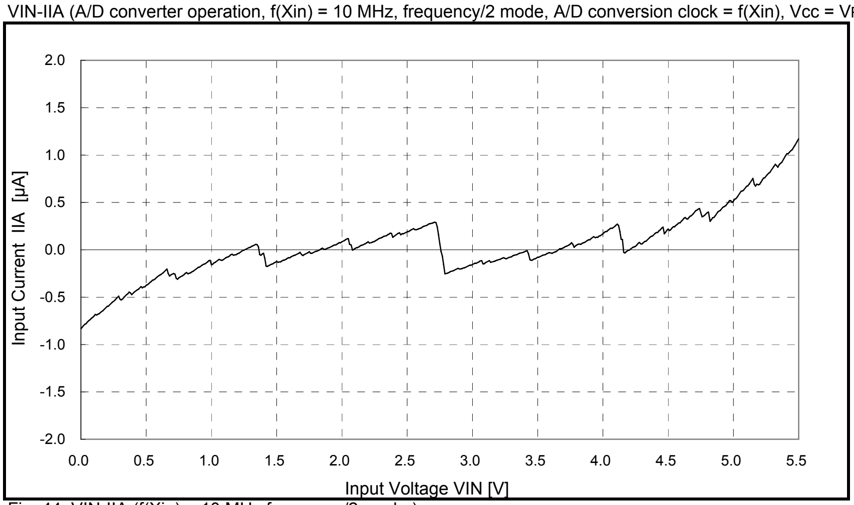


Fig. 44. VIN-IIA (f(Xin) = 10 MHz frequency/2 mode)

VIN-IIA (A/D converter operation, f(Xin) = 8 MHz, frequency/2 mode, A/D conversion clock = f(Xin), Vcc = VREF = 5.5 V, Ta = 25 °C)

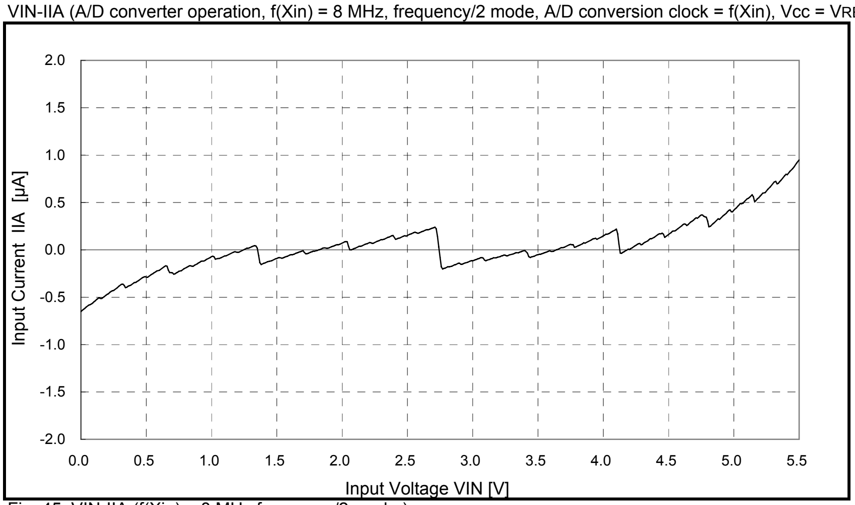


Fig. 45. VIN-IIA (f(Xin) = 8 MHz frequency/2 mode)

VIN-IIA (A/D converter operating, f(Xin) = 4 MHz, frequency/2 mode, A/D conversion clock = f(Xin), Vcc = VREF = 5.5 V, Ta = 25 °C)

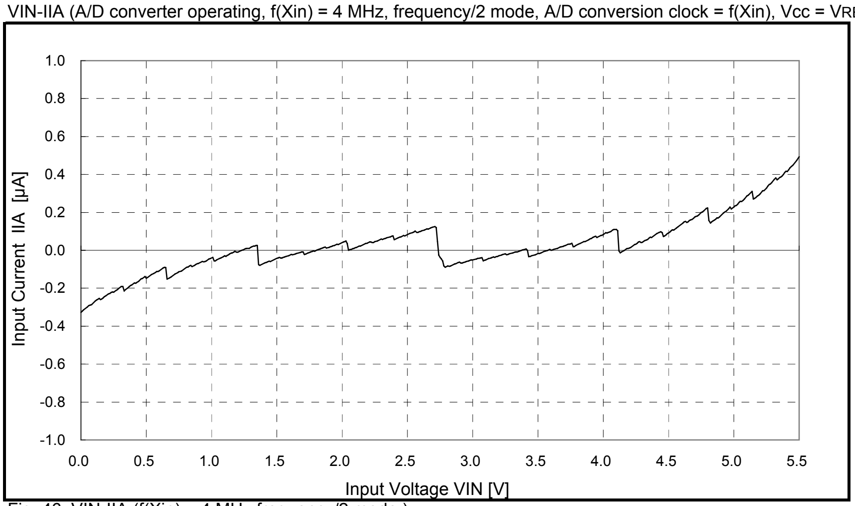


Fig. 46. VIN-IIA (f(Xin) = 4 MHz frequency/2 mode)

VIN-IIA (A/D converter operating, f(Xin) = 2 MHz, frequency/2 mode, A/D conversion clock = f(Xin), Vcc = VREF =5.5 V, Ta = 25 °C)

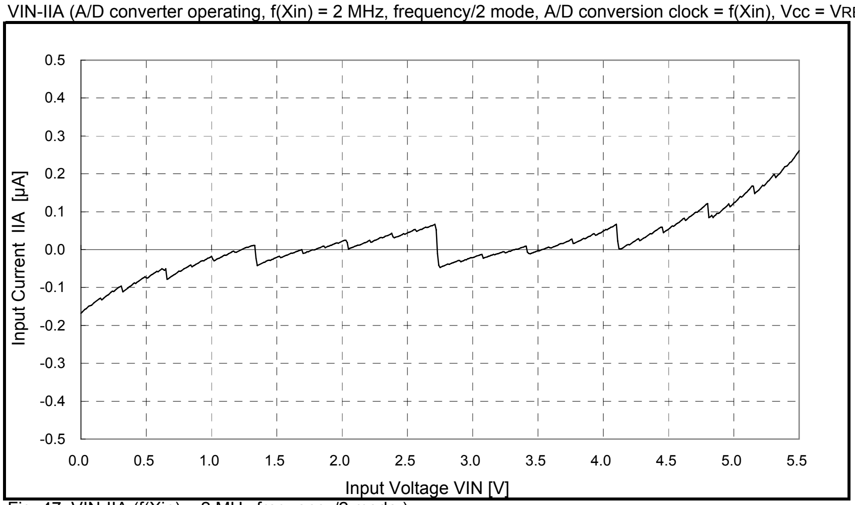


Fig. 47. VIN-IIA (f(Xin) = 2 MHz frequency/2 mode)

(9) On-chip Oscillator Frequency Characteristics Example

On-chip oscillator frequency characteristics (Vcc-OCO)

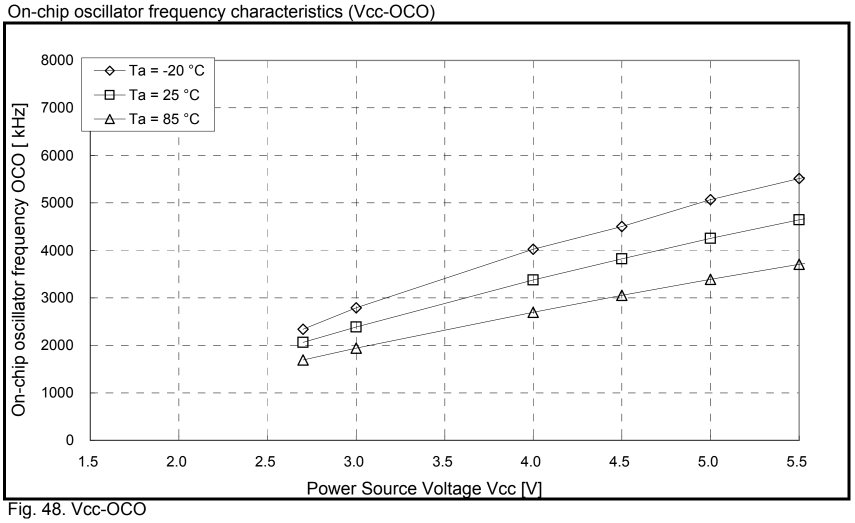


Fig. 48. Vcc-OCO

On-chip oscillator frequency characteristics (Ta-OCO)

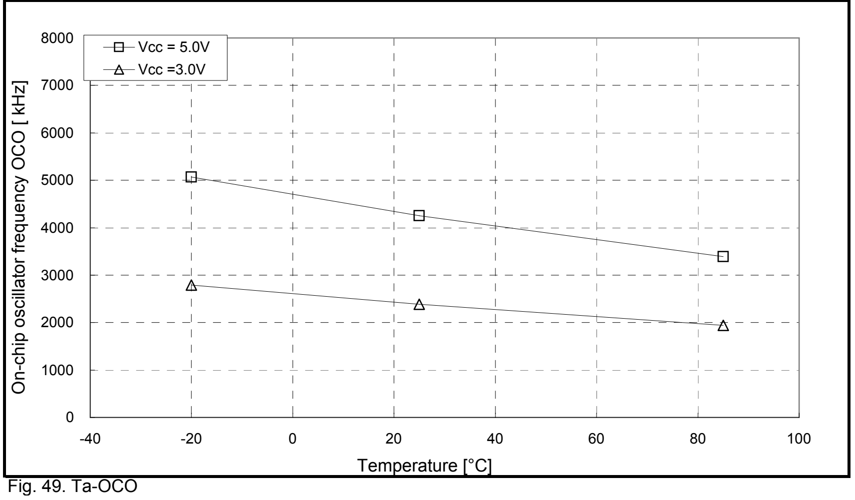


Fig. 49. Ta-OCO

(10) A/D Conversion Accuracy Characteristics
A/D conversion accuracy standard characteristics example-1

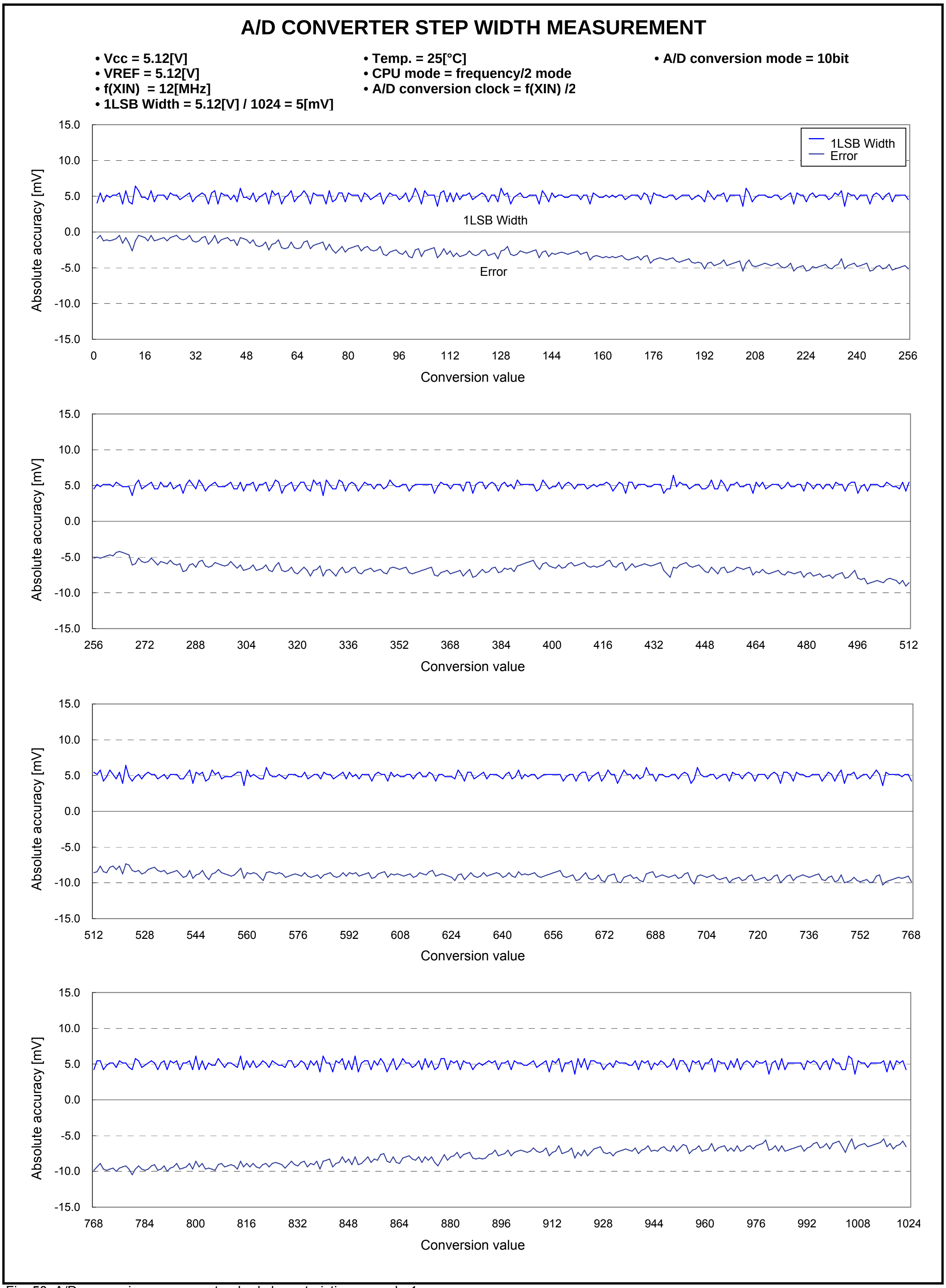


Fig. 50. A/D conversion accuracy standard characteristics example-1

A/D conversion accuracy standard characteristics example-2

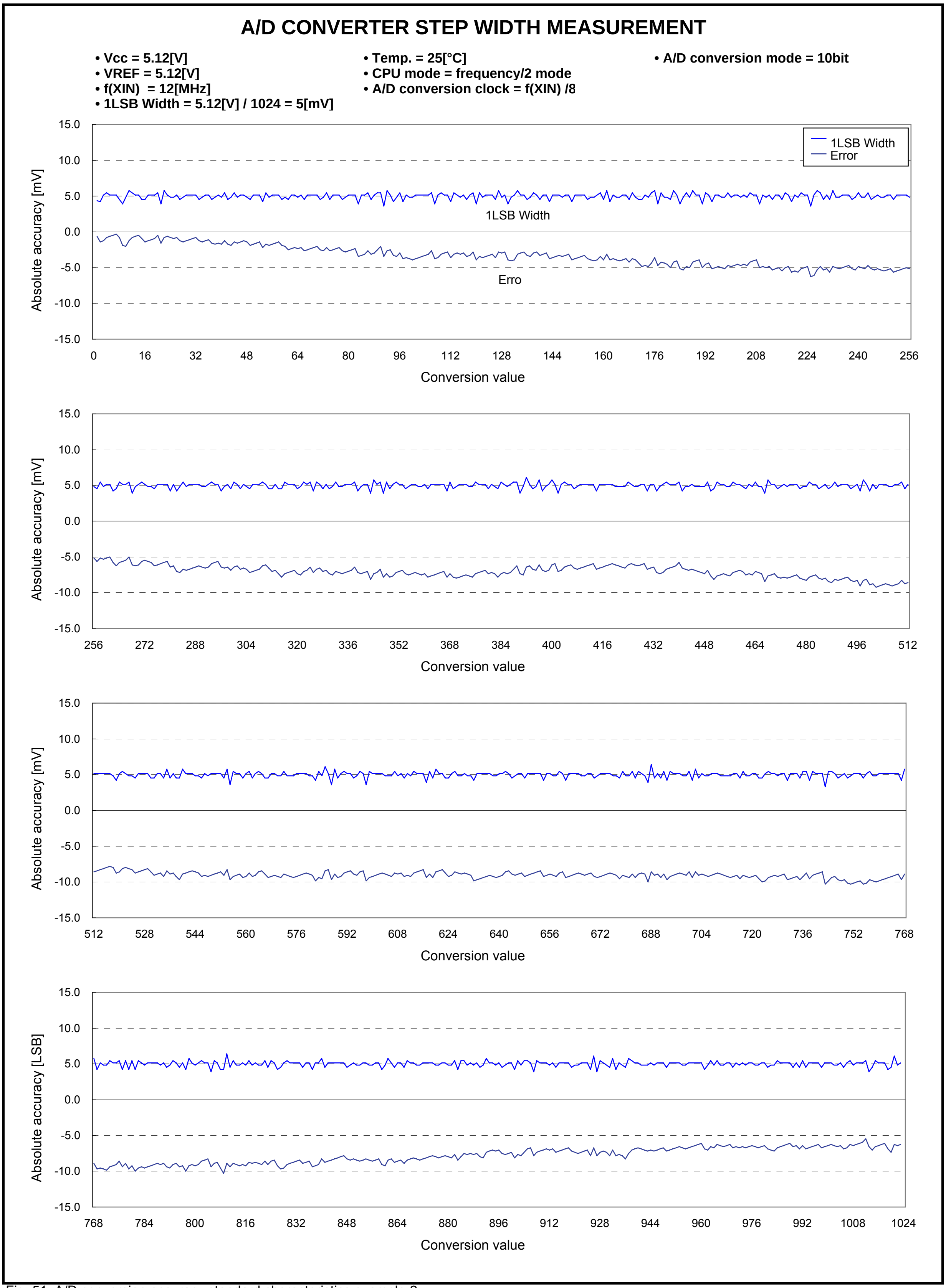


Fig. 51. A/D conversion accuracy standard characteristics example-2

A/D conversion accuracy standard characteristics example-3

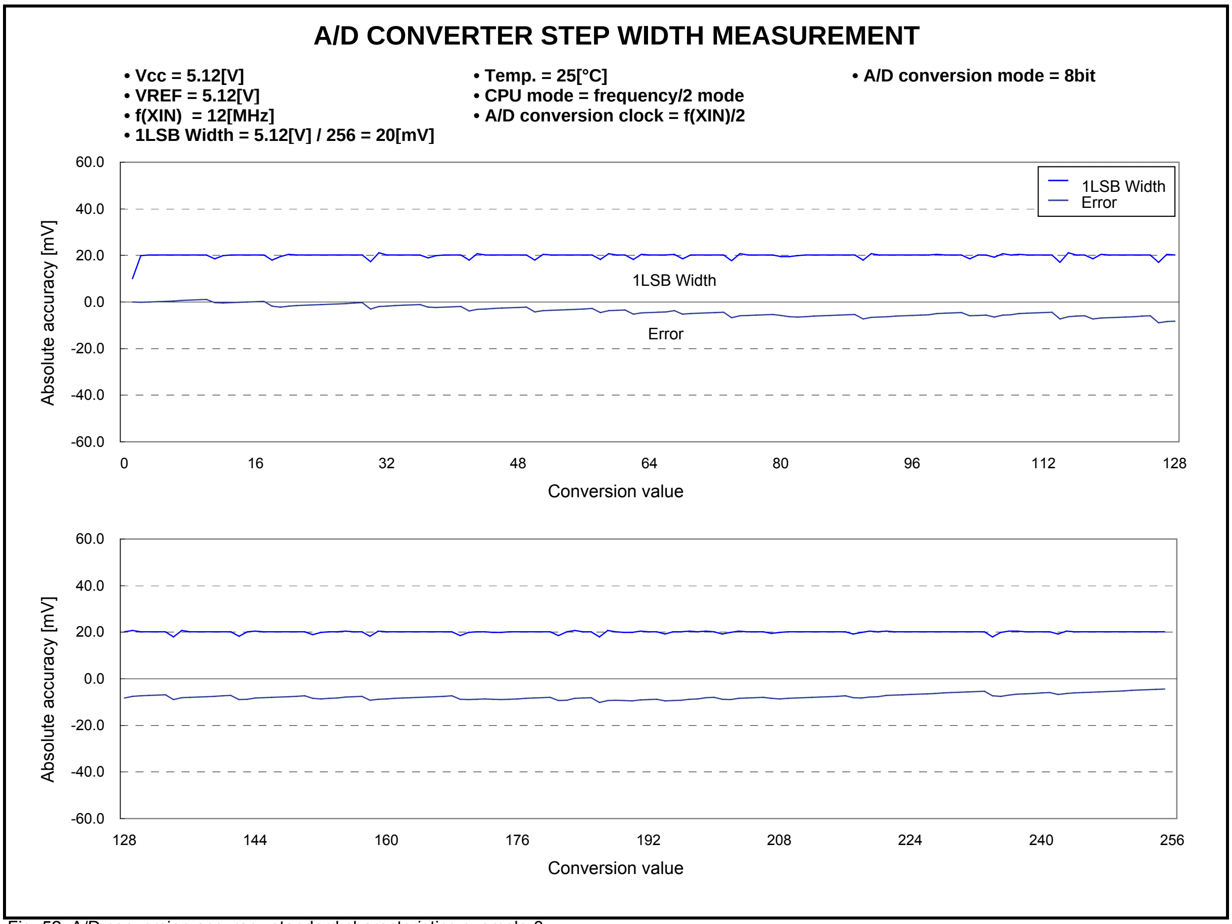


Fig. 52. A/D conversion accuracy standard characteristics example-3

A/D conversion accuracy standard characteristics example-4

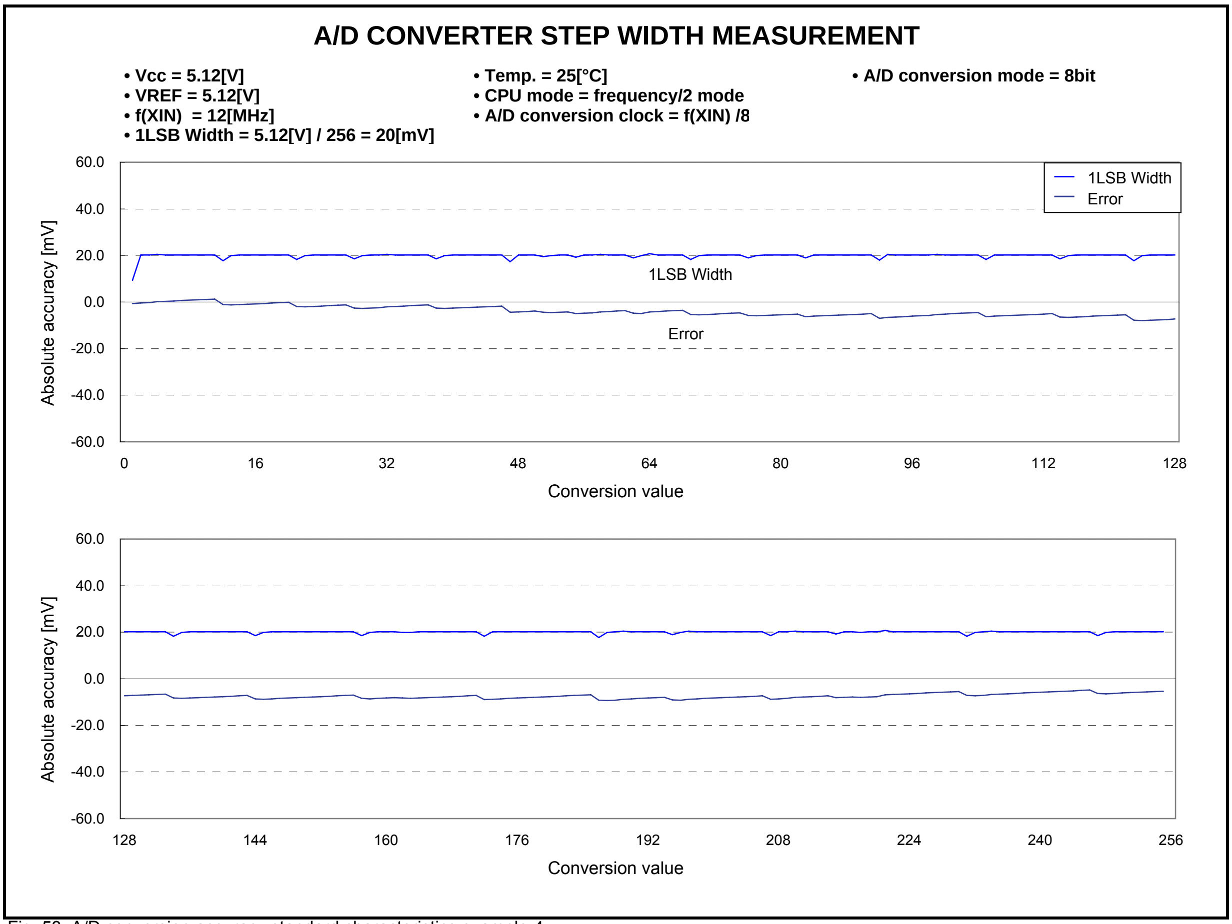


Fig. 53. A/D conversion accuracy standard characteristics example-4

A/D conversion accuracy standard characteristics example-5

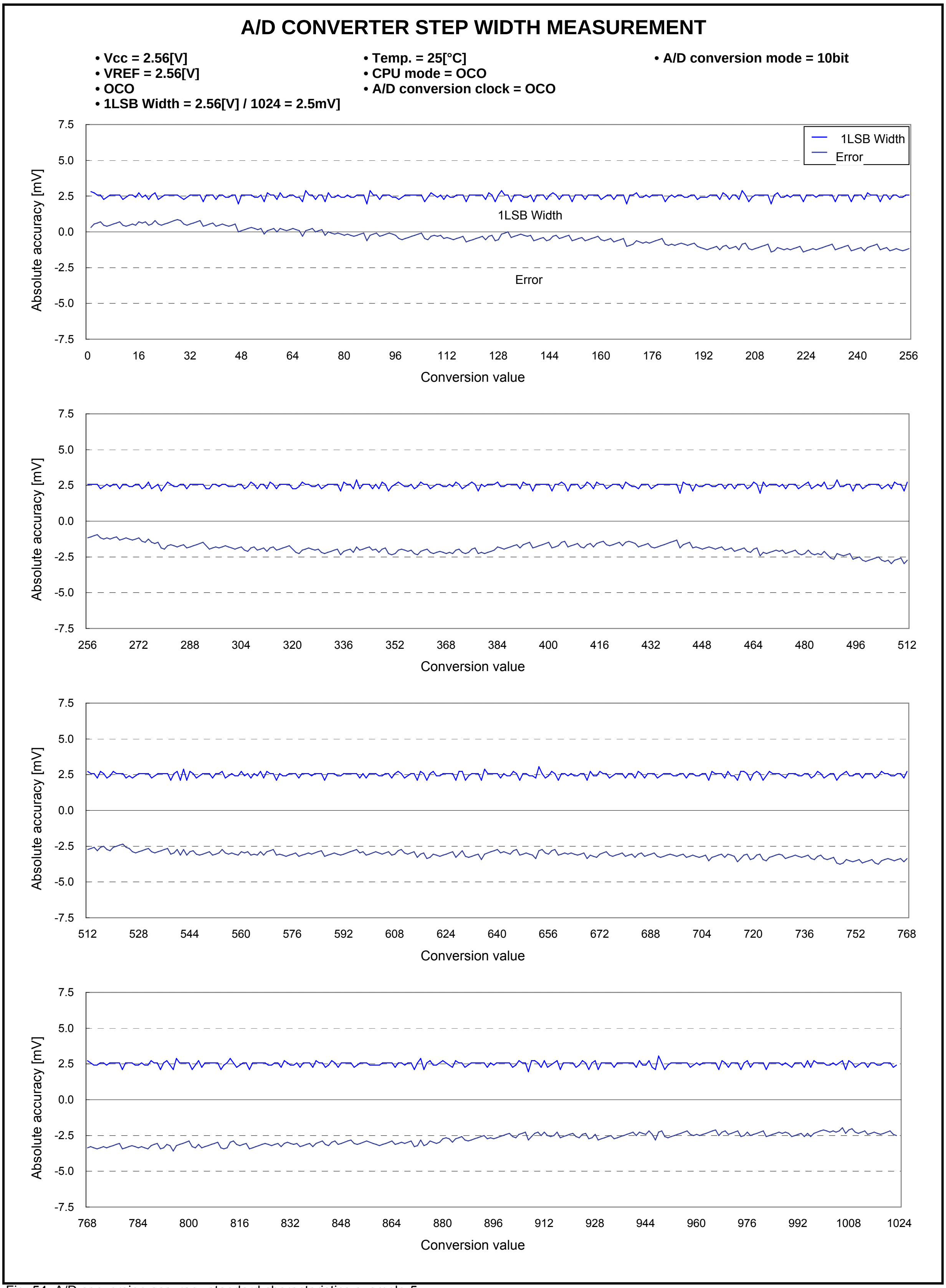


Fig. 54. A/D conversion accuracy standard characteristics example-5

A/D conversion accuracy standard characteristics example-6

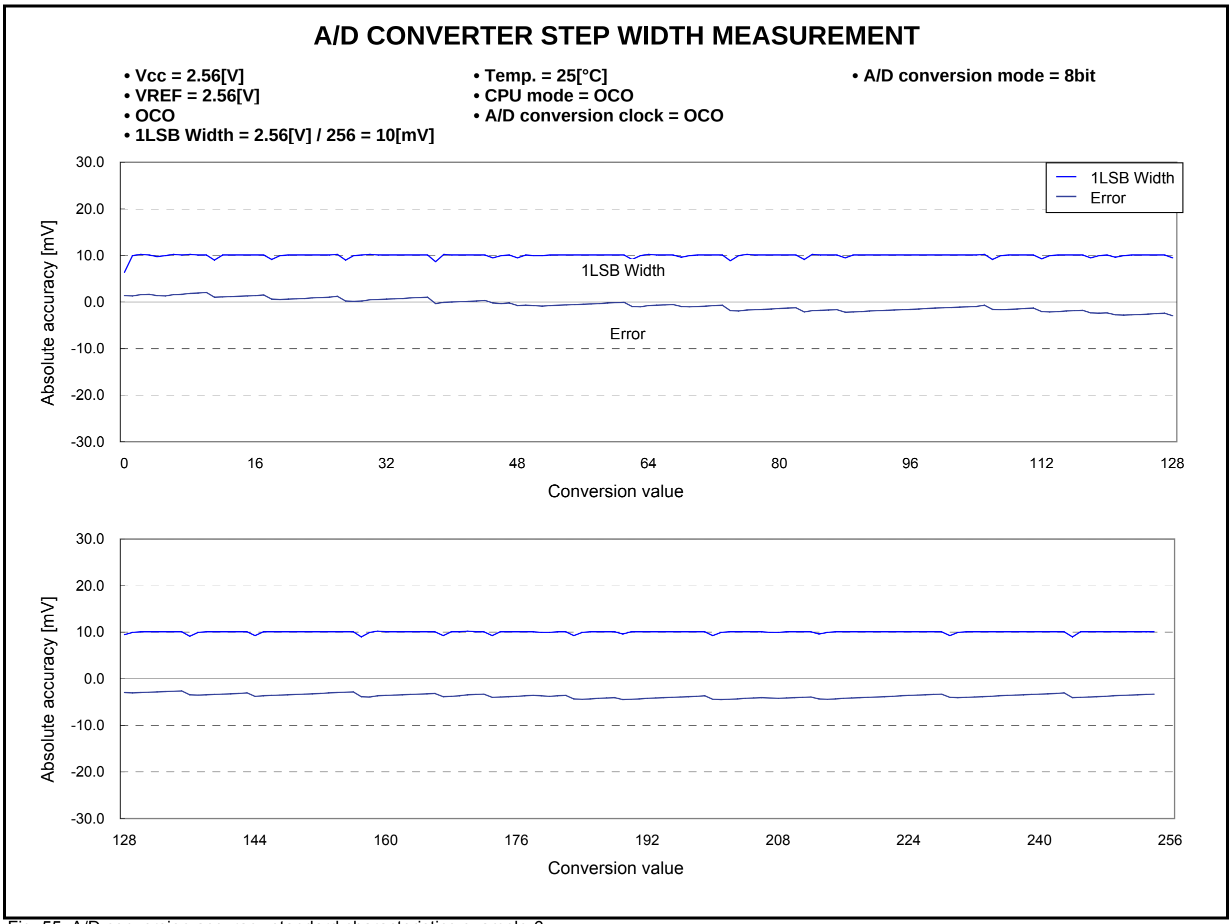
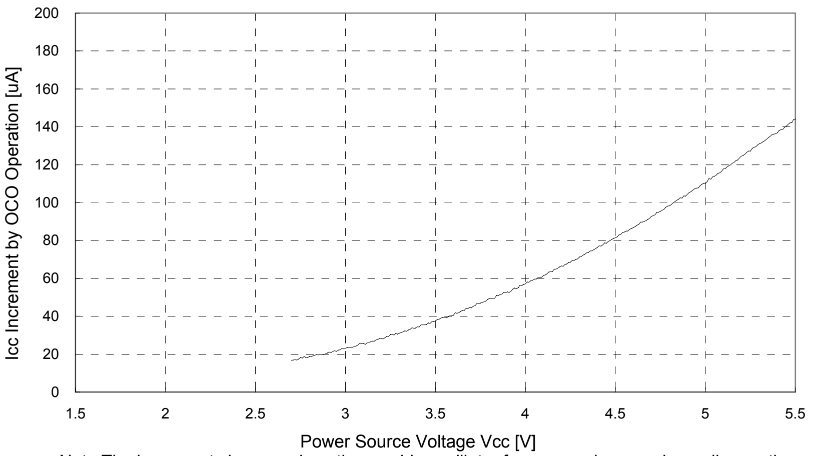


Fig. 55. A/D conversion accuracy standard characteristics example-6

(11) Icc increment by on-chip oscillator operation at f(Xin) operation

f(Xin)=8 MHz (high-speed mode),Vcc= 2.7V to 5.5V, Ta = 25°C, output transistor is in cut-off state, A/D converter not operating)



Note:The increment changes since the on-chip oscillator frequency changes depending on the ambient temperature and VCC.

Fig. 56. Icc increment by on-chio oscillator operation at f(Xin) operation

To our customers,

Old Company Name in Catalogs and Other Documents

On April 1st, 2010, NEC Electronics Corporation merged with Renesas Technology Corporation, and Renesas Electronics Corporation took over all the business of both companies. Therefore, although the old company name remains in this document, it is a valid Renesas Electronics document. We appreciate your understanding.

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April 1st, 2010
Renesas Electronics Corporation

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